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ABSTRACT

Students successful in developmental coursework later do as well or better than students not needing developmental courses. This study examined the performance of 3,873 students new to a college for the fall 1997 semester through the spring 2001 semester. Analysis of variance and logistic regression were used to tease out effects of level of developmental need and age when starting. Consecutive semester attendance and number of courses dropped were significant predictors for degree or certificate completion. Age group interacted with a number of variables examined in the study. (Contains 7 figures, 17 tables, and 19 references.) (Author/SLD)

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Pieces of the Puzzle: Success of Remedial and Non-Remedial Students

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Abstract

Students successful in developmental coursework do as well or better than students not needing developmental courses. The study examines performance of 3,873 students new to the College for the Fall 1997 semester through the Spring 2001 semester. ANOVA and Logistic regression were employed to tease out effects of level of developmental need and age when starting. Consecutive semester attendance and number of courses dropped were significant predictors for degree or certificate completion. Age group interacted with a number of variables examined in the study.

Pieces of the Puzzle: Success of Remedial and Non-Remedial Students

Introduction

In an environment of commitment to access to education for "all learners who desire to be educated," our College provides developmental education in English, reading, and mathematics for students who would benefit from these courses. One-third of the new students at the college enroll in one or more developmental courses in mathematics, English, or reading. In 1996, the College began to use COMPASS, a computerized placement test developed by ACT, for assessing all new full-time students and students wanting to enroll in English or mathematics classes. Since then, the College has engaged in a variety of tracking measures to assess its developmental education program. This study was designed to assess developmental student performance in college level courses and their persistence toward earning a degree or certificate.

The need for developmental education is substantiated by a variety of sources. "Historically, remediation of academic skill deficiencies has been a means to bring uneducated at-risk populations into the mainstream of society, making it possible for them to achieve the 'American dream' of self-sufficiency" (Spann, p. 4). Currently, there is the issue of educating students to meet the increasing literacy and computing demands of the workplace. U. S. Department of Labor statistics indicated that "In 2005, three-quarters of all employment will demand one or two years of postsecondary education; just 4.5 percent will require a high school diploma or below; and the remaining 10.5 percent will call for a bachelors degree or higher" (U. S. Department of Labor, qtd. in ICCB, 2001, p. 1). Workers will be expected to learn on the job and apply their learning in problem solving situations. These learning skills must be "built upon a solid foundation of math, reading, communication skills, and an ability to use technology" (ICCB, 2001, p. 1).

Who are the at-risk students? The 1997 ICCB report, "Remedial/Developmental Education in the Illinois Community College System," suggested that among students at highest risk for needing remedial coursework are recent high school graduates, although these figures may be influenced by college assessment policies. Boylan, Bonham, and Bliss (1994) reported that most developmental students fall in the 18-24 year old, or traditional-age, bracket. They also reported slightly more female than male students enroll in developmental education classes. Most developmental students were white (67%) and the largest minority group was African Americans (23%).

Similarly, an Illinois Community College Board study found the number of recent Illinois high school graduates considered at risk increased from one in six students in 1991 to one in four students in 1996 (ICCB, 1997). According to their report, minority students are over-represented in remedial/developmental courses. Additionally, minority students were more likely to need remediation in all three areas, math, English, and reading, as compared to the majority of white students who needed remediation in only one area (ICCB, 1997). In general, students were least prepared in mathematics and most students needed to improve skills in only one area (ICCB, 1998).

Boylan, Bonham, and White (1999) suggested several variables that should be considered when evaluating developmental program outcomes. Specifically, the authors stated, "Knowledge of program outcomes such as course completion rates, grades in developmental courses, and grades in follow-up curriculum courses is essential to revision and improving programs." The authors cited evidence indicating "passing developmental courses is related to higher grades and increased student retention . . . that students who passed developmental courses were more likely to pass their first curriculum course in the same or a related subject.

They were also more likely to be retained than students who did not participate in developmental education" (pp. 92-93).

Day and McCabe (1997) cited Boylan's study claiming that "results of remediation are encouraging as participating students earn higher grades and persist longer than their non-participating peers." Even more impressive, is their claim that students who completed remedial courses were as successful as those who began academically prepared. Similarly, a study completed by the Illinois Community College Board (2001) found that completion of remedial courses did have a positive effect on such educational outcomes as: cumulative grade point average, ratio of credit hours attempted to credit hours earned, and persistence (Illinois, p. i). In regard to time required to complete remedial requirements, Day and McCabe (1997) reported that about two-thirds of the students enrolled in remedial courses completed their preparatory studies in less than a year. The post-remediation GPAs of students who completed remedial courses were higher than the GPAs of students who tested into remedial courses but did not take them. The post-remediation GPAs of students required to take remedial courses were slightly lower than the GPAs of students who were exempt from taking remedial classes. However, this difference became less pronounced over time (Boylan and Saxon, p. 11).

There is compelling evidence in the literature of the efficacy of developmental education based on post-remediation GPAs in English and mathematics. With regard to the success of students in the specific subject areas, the effectiveness of remedial English and mathematics is supported by data that suggest that students completing these courses pass their first college-level English and mathematics courses. Boylan and Bonham (1992) reported that 91% of the students successfully completing a developmental writing course passed freshman composition and that 77% of the students completing developmental mathematics were successful in their

first college-level mathematics course. However, results were slightly different for students taking multiple remedial courses and/or reading courses. Although most students (83%) completing developmental reading courses were able to pass their initial social science courses (Boylan & Bonham, 1992, cited in Corr), research indicates students placing into developmental reading may be among the most academically at-risk students.

Reading is a critical skill needed for success in many courses, including mathematics. Adelman (1996) noted that a reading deficit may indicate "comprehensive literacy problems" (ICCB, 1998, p. 6). This literacy deficit negatively impacted reading of texts and hence limited access to key course concepts and hinders performance on course assessments. In addition, the ICCB (1998) report cited a study by the Maryland Higher Education Commission (1996) showing that the students needing multiple remedial classes were not as likely to succeed as students taking fewer remedial classes. Adelman (qtd. in Boylan, 1999) concurred saying that "students who place in the lowest levels of two or more remedial classes have very weak potential for college success to begin with" (p. 2). In fact, students taking multiple developmental classes have the "lowest completion rates of any group of students" (ICCB, 1998, p. 6). The combination of placing in multiple developmental courses including reading courses is an indicator of students who are at the greatest academic risk (ICCB, 1997, p. 6).

In a landmark study of students earning a bachelor degrees, Adelman (1999) scrutinized retention measurements such as consecutive semester attendance, ratio of credits earned to credits attempted, and ratio of withdrawals to total number of courses. Adelman discounted full-time or part-time student status as a factor, since even students starting as full-time may be part-time before completing their first semester; instead, he indicated consecutive attendance was a

more important factor to consider. Adelman's study was sufficiently convincing to suggest we consider these factors when examining graduation rates.

Boylan and Saxon (2000) cited a variety of studies that support the correlation between remediation and retention. They concluded that the "available evidence suggests that students who participated in remediation were likely to be retained at rates at least as high and frequently higher than those who do not. This finding has been consistent in all studies conducted since 1983" (p. 13). Boylan and Saxon warned, however, that retention is not the main purpose of remediation. The purpose of remediation is to improve the academic skills needed to succeed in college-level courses. Success in college courses might well increase student confidence, create a positive attitude toward school, and hence, improve student retention. However, retention is affected by many variables other than academic preparedness, such as student intent. Boylan and Saxon advised that using retention data to evaluate remedial programs is a "measurement that should be interpreted with caution" (p. 11).

Another essential piece of the remediation puzzle at community colleges is mandatory assessment and placement in developmental courses. According to the report from the Illinois Community College Board Task Force on Remedial Education (2001), "Best practice indicates that standardized tests provide the greatest uniformity in efforts to assess basic skills among incoming degree-seeking students" (p. 5). Additional support for mandatory assessment comes from Boylan, Bliss, and Bonham (1997) who stated, "Students participating in programs featuring mandatory assessment were significantly more likely to pass their first developmental English or mathematics courses than students in programs where assessment was voluntary" (p. 4). John Roueche (1999) critiqued voluntary placement in college remedial courses saying that voluntary placement is a shortcoming in a developmental/remedial program. He questions why

colleges invest the time and effort to assess students' skill levels and then "leave the decision to enroll in remedial courses in the hands of the unprepared students" (p. 47). Boylan, Bonham, and Bliss (1997) also related mandatory placement and success in developmental courses. They stated that students were more likely to pass their developmental English and mathematics courses in community colleges that had mandatory instead of voluntary placement. In addition, Starks (1989) claimed that mandatory placement may be a factor in improved retention among students who successfully completed their developmental classes. Students who overestimated their level of preparation and failed or withdrew from classes are unlikely to be retained. On the other hand, accurate placement paved the way for students to be successful during their first attempts at college coursework (Starks, 1989).

The 2001 study of remedial education in Illinois conducted by the Illinois Community College Board (ICCB) reinforces the importance of variables discussed in this paper. Additionally, the ICCB recommends: improving articulation between college and feeder schools, encouraging high school students to complete four years of mathematics, and establishing prerequisites "limiting access to courses which require the skill which needs remediation" for strengthening remedial education in Illinois (pp. 3-4).

According to the literature, the importance of preparing students to be successful in their college-level work is a crucial role of the community college. Ninety-nine percent of the community colleges across the nation provide developmental courses. Because of the pervasiveness of developmental offerings at colleges, there needs to be serious evaluation of program effectiveness. This study is a contribution to the dialogue on the impact and effectiveness of developmental education at the college level.

The Study

The study was designed to track the Fall 1997 cohort of students new to our college. While we were interested in comparing performance of students successfully completing developmental courses with students not successfully completing them, we were interested in comparing both developmental groups with students not required to complete developmental courses also. Successful completion was defined as completing the highest level course in a developmental subject area with at least a grade of C. Successful college course completion was defined as a grade of at least C also. Students were tracked through the spring 2001 semester.

The Cohort Sample

There were 4,440 new students enrolled for the Fall 1997 semester. However, 567 new Adult Educational Development (AED) students took courses that lead to a General Educational Development (GED) high school graduation equivalency. Only non-AED students first enrolled during the Fall 1997 semester were included in the study.

Initial information gathered about the 3,873 non-AED new students included: ethnicity, gender, age, student intent, and COMPASS placement test scores. It should be noted that many students did not take the placement tests resulting in a large group of students where the need for developmental courses was unknown. Because of the large group in the "need for developmental courses unknown" category, ACT and prior degrees (or certificates) earned elsewhere were added to the initial information. About 33% of the new Fall 1997 students took one or more developmental courses. Figure 1 shows the percent of new students taking developmental courses in the three areas of English, mathematics, and reading.

Insert Figure 1 about here.

Data Elements

Many of the data elements collected for each student in the cohort were selected because they were directly related to variables found in the literature or because we considered them potentially important. Data collected included: student demographics elements (age, ethnicity, gender, and student intent), grades for courses taken (and the credit values), indicators for semesters attended, cumulative grade point average (GPA), and degrees or certificates earned. From the course level data several additional variables were created including:

- the number of course withdrawals during the first semester,
- the total number of college course withdrawals,
- the ratio of college credits earned to college credits attempted (expressed as a percent),
- the total number of college credits attempted,
- the number of semesters attended,
- the number of consecutive semesters attended (excluding summer), and
- indicator variables for each developmental area flagging students needing developmental courses but not taking them, students needing developmental courses and taking them, students not needing developmental courses, and students where the need was unknown.

A few students elected to take developmental courses without taking the placement test and they were considered in the students needing and taking group for analysis.

All new full time students or students wanting to enroll in English or mathematics courses are supposed to take a placement test. However, students with a bachelor's degree, students with sufficiently high ACT scores, and older adults are not required to take placement tests. Therefore, placement test results were not available for many new (particularly part-time and older adult) students. Table 1 reports the number of new students not taking the COMPASS placement test, not needing developmental coursework, and the number needing developmental coursework. The numbers in the "Courses Not Needed" and "Courses Needed" columns are for students that took the COMPASS placement tests.

Insert Table 1 about here.

Among students taking the COMPASS placement tests and placing into developmental subjects, most took developmental courses. For developmental mathematics, 66.5 % of the students needing developmental courses took them. Percentages were higher for developmental English (71.5 %) and reading (71.7 %).

Many of the students not taking the placement test were part-time students not enrolling in either mathematics or English courses. Full-time students are required to take placement tests also, but almost 57 % of the new students were part-time. Students over age 24 years are not required to take placement tests and students with sufficiently high ACT scores or that successfully completed college coursework in mathematics or English elsewhere may be exempt from taking the COMPASS placement tests also. Other students had prior degrees or certificates from other colleges and obtained a waiver from placement testing. About 20 % of the new students did not take the mathematics placement test and about 25 % did not take the English or

reading placement tests because they had ACT waivers or prior degrees from other colleges. Fifty-three percent of the new students did not take the mathematics placement test and almost 62% of the new students did not take English or reading placement tests.

Results

Several comparisons were made among students enrolled in developmental courses and students not enrolled in developmental courses. Additional comparisons were made among students successfully completing a developmental course sequence and students not successfully completing a developmental course sequence.

Group comparisons were done on several variables including: student demographics (age, ethnicity, gender, and student intent), grades earned in non-developmental courses, cumulative grade point average (GPA), student retention, and completion rate.

Most new students taking developmental courses took them in only one subject area and more students enrolled in developmental mathematics than in English or reading. Figure 2 shows the percent of students enrolling in none to three developmental subject areas, and the percent of students enrolling in each developmental subject area.

Insert Figure 2 about here.

Age group comparisons

Age of student was a significant factor in whether or not students took COMPASS placement tests. Generally, students are required to take the mathematics placement test before enrolling in mathematics and English and reading placement tests before enrolling in English. However, for reasons previously mentioned, many students did not take the placement tests and

the result was relatively large numbers of students without placement test scores. This was most evident when student age groups were considered.

Three age groups were defined for analysis: students 18 years or younger (typically, this group is comprised of students enrolling in college immediately after graduating from high school), students 19 to 24 years of age, and students age 25 years or older. Table 2 reports the percent of students for each age group *not* taking the COMPASS placement in each subject area. It is very evident that most older students did not take placement tests in any of the subject areas tested.

Insert Table 2 about here.

Among the students that needed to take developmental courses, age group was a significant factor in whether or not students took the courses and the relationship was linear. The older the age group, the lower the percent of students taking developmental courses among students needing them. Figure 3 graphically illustrates the relationship.

Insert Figure 3 about here.

Very few students without COMPASS placement test scores took developmental courses in any of the subject areas. In all developmental subject areas, among students needing developmental courses, the youngest age group had the highest percent taking the needed courses.

Ethnic Group Comparisons

Figure 4 shows the percent of each ethnic group enrolled in developmental subjects as well as the percent of all new students (for which ethnicity was known) enrolled in developmental subjects. The percent of all new students enrolled in a particular developmental subject area as reported in Figure 4 varies slightly from the percents reported in Figure 2. The reason for the variation is that ethnicity data was not available for almost nine percent of the new students.

Insert Figure 4 about here.

African-American students were over-represented in developmental courses when compared to their percent (3.9%) in the cohort. A disproportionate number of African American students (21.6 %) took courses in all three developmental subject areas also. Percents of students taking courses in all three developmental subject areas for the other ethnic groups were: Asian 3.0 %, American Indian none, Hispanic 8.2 %, White 7.2 %, and International 11.1 %.

Gender Comparisons

There were no significant gender differences among students enrolling in either developmental mathematics or reading. However, significantly more new male students (19 %) than new female students (14 %) enrolled in developmental English. Table 3 reports the number and percent of new male and female students enrolling in developmental courses.

Insert Table 3 about here.

Student Intent Comparisons

Students indicating that they intended to earn a bachelor's degree were more likely to enroll in developmental courses. This was true regardless of whether or not the students intended to earn either a certificate or an associate's degree first. Students intending to earn only a certificate or not intending to earn any type of degree or certificate were least likely to enroll in developmental courses. The percent of students enrolling in developmental courses within each student intent category are shown below in Figure 5.

Insert Figure 5 about here

Age group was a significant factor for whether or not the student was intending to earn a degree or certificate. About 84 % of the students in the 18 years or younger age group intended to pursue a degree or certificate and about 73 % of the 19 to 24 years age group intended to pursue a degree or certificate. This compares with only 41 % of the students in the 25 years or older age group that intended to earn a degree or certificate.

Coursework Comparisons

Students taking developmental courses also took a wide range of college level courses before, during, or after taking their developmental courses. Not all courses taken by new students were included in these analyses. ESL and courses of students earning a degree elsewhere before enrolling at the College were excluded. These results are summarized in Table 4.

Insert Table 4 about here.

Students successfully completing the developmental mathematics courses were more successful in first attempts of other college courses than students not successfully completing the developmental mathematics courses ($z = -28.2$, $p < .01$). This was true regardless of whether other college courses were taken before, during, or after successfully completing the developmental mathematics courses.

Students successfully completing developmental English were significantly more successful in first attempts of other college courses than students not successfully completing developmental English regardless of when the other college courses were taken (z -20.6, $p < .01$). The same significance pattern was evident for students successfully completing developmental reading courses when compared to students not successfully completing developmental reading courses ($z = -20.3$, $p < .01$). It should be noted that students not successfully completing their developmental English courses still did considerably better in other college courses taken after the developmental courses than they did in other courses taken before or concurrently with developmental English. The same pattern was evident for students that did not successfully complete developmental reading courses; they did considerably better in first attempts of other college courses taken after the reading courses.

The next group of college course comparisons looked at differences among students completing developmental courses ("Needed, successful" or "Needed, not successful"), those not needing developmental courses based on either COMPASS placement test results or ACT scores ("Not needed"), students that needed but did not take developmental courses ("Needed, not

taken"), and students whose need for developmental course work was unknown ("Need unknown"). As before, ESL courses and courses of students with prior degrees were excluded from the analyses. Table 5 shows the number of college courses taken and the number resulting in a grade of C or better (labeled ABC) as well as average number of courses per student within level of developmental course need.

Insert Table 5 about here

Students not needing developmental courses and students successfully completing developmental courses took significantly more college level courses than students in any other level of developmental need group. The same two groups of students (students not needing developmental courses and students successfully completing developmental courses) earned significantly more A, B, and C grades on first attempts of college-level courses than any other level of developmental need group also.

Univariate analyses of variance with number of different college-level courses attempted as the dependent variable were done to test for differences among the different levels of developmental course need. Because age group was a factor in the number of courses students attempted, a full factorial model with level of need for developmental subject area and age group as factors was used. Results of the analyses are reported in Table 6. Level of developmental subject need was a significant effect within all three developmental subject areas. Age group and the Level of Need-Age Group interaction effects were significant also but not as strong (in terms of variance accounted for) as the level of developmental course need effect.

Insert Table 6 about here

When the analyses were repeated using number of A, B, and C grades in first attempts of college-level courses, similar results were found as shown in Table 7.

Insert Table 7 about here

Grade Point Average (GPA) Comparisons

Several analyses of student cumulative GPA were done. Students with degrees earned elsewhere were excluded from the analysis. Students in the "Needed, successful" category were students that completed the highest level developmental course with a grade of C or better. Students in the "Needed, not successful" category either did not take the highest level developmental course or took the course but did not earn a grade of C or better. Table 8 reports GPA means and standard deviations within each developmental subject area for each age group and Table 9 reports results of the ANOVA analyses.

Insert Table 8 about here

Insert Table 9 about here

For the three developmental subject areas, students in the "Not needed" group had mean GPAs higher than the mean GPA for students in the "Need unknown" group. Across the three age groups, students in the "Needed, successful" group had higher mean GPAs than the "Need unknown" group in mathematics and in English for the two younger age groups but only for the 19 – 24 year age group in reading. Except for the older age group (25 years or older) in reading, students in the "Needed, successful" had higher GPA means than students in the "Needed, not successful" or "Needed, not taken" groups. However, the mean GPA for students in the "Needed, not taken" group was significantly higher than the mean GPA for students in the "Needed, not successful" group. This pattern occurred for every developmental subject area. All of the GPA means for students in these two groups were below 2.0. It is speculative, but means in the "Needed, not taken" group are high enough that many of these students may have been in the "Needed, successful" group had they taken the developmental courses.

As indicated in Table 9, level of developmental course need and age group were significant main effects and the interaction of the two was significant also except for the reading subject area. Generally however, the effects were weak, accounting for less than ten percent of the variance.

Figure 6 graphically portrays GPA means for each of the three age groups within each developmental need category. Where the line for one age group crosses the line of another age group, there is an interaction.

Insert Figure 6 about here

Regardless of developmental subject area or age group, students that took developmental courses and that were not successful had the lowest average GPAs. This result was most striking for the developmental English and reading areas. Within age groups, it was true for mathematics also with one exception. Students in the 18 years or younger age group needing and not taking developmental mathematics had a slightly lower GPA average than students unsuccessful in developmental mathematics.

Retention Rate Comparisons

Retention rates are important to consider because they frequently are reported in literature concerning the efficacy of developmental or remedial programs. Excluding students that had earned a degree or certificate elsewhere, the overall fall-to-spring retention rate was 63.8 %, retention rates within developmental subject areas are shown in Table 10. The table shows fall-to-spring retention rate for each level of development course need within each of the developmental subject areas. Clearly, students in the "Need unknown" category had the lowest retention rate, regardless of developmental subject area. This is likely due to many of these students intending to take only one or two courses. It is clear that students in the "Needed, successful" had the highest retention rates, even higher than the rates for students not needing developmental courses. Students in the "Needed, not taken" and "Needed, not successful" categories had retention rates significantly lower than either the "Needed, successful" or "Not needed" categories. The retention rates among the levels of developmental course need were significantly different within each of the subject areas (mathematics $\chi^2_4 = 586$, $p < .01$; English $\chi^2_4 = 490$, $p < .01$; reading $\chi^2_4 = 482$, $p < .01$).

Insert Table 10 about here.

The overall fall-to-fall retention rate was 45.2 %, considerably lower than the fall-to-spring retention rate. Table 11 reports fall-to-fall retention rates within each developmental subject area for each level of need. The retention rates followed the same pattern as the fall-to-spring retention rates. Retention rates among the levels of developmental course need were significantly different within each of the subject areas (mathematics $\chi^2_4 = 642$, $p < .01$; English $\chi^2_4 = 507$, $p < .01$; reading $\chi^2_4 = 459$, $p < .01$).

Insert Table 11 about here.

There was a significant linear decrease in both fall-to-spring and fall-to-fall retention rates among the three age groups of students ($p < .01$). As age group increased, retention rates decreased. These results are shown in Table 12.

Insert Table 12 about here.

Although 80% of the students 18 years or younger returned for the spring semester and 62% returned for the following fall semester, the percents had dropped to 44% and 27% for students in the 19 to 24 years and 25 years or older groups respectively.

Figure 7 graphically portrays retention rates for developmental subject areas and for the different age groups.

Insert Figure 7 about here

The lines drawn for the "Not needed" and "Needed, successful" illustrate the much higher retention rates for students at these levels compared to the other levels. The lower graph illustrates the linear drop in retention rate as the age groups progress from younger students to older students. For both graphs, the fall-to-fall retention rates are considerably lower than the fall-to-spring retention rates.

Graduation Rate Comparisons

Of the 3,351 students in the original sample that had not previously earned a degree or certificate, 469 or 14% earned a degree or certificate during the four years studied. Students successful in developmental mathematics obtained degrees at a higher rate (36%) than students not needing developmental mathematics (27%). The rates for students from these two levels of need groups are more than twice the rate for students in the "Needed not taken" group (12%) which had the third highest graduation rate. Students successfully completing developmental English had a slightly lower graduation rate (19%) than students not needing developmental English (21%) and students successfully completing developmental reading had a graduation rate (18%) even closer to the rate for students not needing developmental reading (19%). Students in the successfully completing developmental English or reading had considerably higher graduation rates than students in the unknown need groups (12%). Regardless of developmental need subject, students that were in the "Needed, not successful" groups had very low graduation rates ranging from 1.9% to 3.9%.

For each developmental subject area, Table 13 reports number and percent of students earning degrees or certificates within age groups and level of need for each developmental subject area.

Insert Table 13 about here.

The graduation rate for students in the youngest age group (20%) was significantly higher ($\chi^2_2 = 78$, $p < .01$) than the graduation rate for students in the 19 – 24 year age group (10%) or students in the 25 years or older age group (9%).

Students taking courses in only one developmental area had a significantly higher graduation rate than students that did not take developmental courses ($\chi^2_2 = 14.6$, $p < .01$). In addition, taking developmental courses in two or three developmental areas did not result in a graduation rate significantly different from the rate for students not taking developmental courses. These results are likely due to the many students that take only developmental mathematics as the graduation rate for students successfully completing developmental mathematics was 36%. Table 14 reports graduation rates by number of developmental subject areas studied.

Insert Table 14 about here.

Comparisons of graduation rates should also consider student intent. Table 15 shows percent of students earning degrees or certificates for each age group and initial intent. Almost one third of the students (32 percent) indicated they did not intend earning any degree or

certificate. Another 14 percent indicated they did plan on earning a bachelor's degree but not earning an associate's degree or certificate first. Over half of the older adults did not intend to earn a degree or certificate.

Insert Table 15 about here.

Significantly more students in the youngest age group earned a degree or certificate than students in either of the two older age groups. It is also worth noting that though some students initially indicated no interest in earning a degree or certificate, some, particularly students in the youngest age group did earn a degree or certificate. Counted among students not intending to earn an associate's degree or a certificate were students that indicated plans to earn a bachelor's degree without earning an associate's degree first.

To examine the simultaneous impact of variables (such as needing developmental coursework, age group, ethnicity, student intent, or gender) on the likelihood of a student completing a degree or certificate, a logistic regression analysis was conducted. The dependent variable was earning a degree or certificate (value of one) or not earning a degree or certificate (value of zero). The initial independent variables included indicator variables for: level of developmental course need for each subject area, ethnicity, and gender. Other variables included: student intent (coded as 1 if the student intended to earn a degree or certificate at the College), ratio of college credits earned to college credits attempted (expressed as a percent), total college credits attempted, number of semesters attended, number of consecutive semesters attended (excluding summers) coded as 2 if students attended two or more consecutive semesters, age, number of first semester course withdrawals, and total number of college course

withdrawals. As in the GPA analyses, students that had earned degrees or certificates elsewhere were excluded from the analysis.

Ethnicity, gender, and developmental English and reading variables were not significant ($p > .1$) in the initial analyses. Recoding ethnicity to a non-minority or minority indicator variable still resulted in a non-significant result. The results of final analyses, using the reduced variable set, are shown in Table 16.

Insert Table 16 about here.

In viewing Table 16, negative logistic regression weights (B) for indicator variables indicate presence of the factor reduces the likelihood of a student earning a degree or certificate while increasing values on non-indicator variables decreases the likelihood of earning a degree or certificate. Positive logistic regression weights for indicator variables indicate presence of the factor increases the likelihood of a student earning a degree or certificate while increasing values on non-indicator variables increases the likelihood of earning a degree or certificate. Another useful column is the column labeled "Exp(B)," where values above one indicate the amount the variable considered (all other factors held constant) increases the likelihood the student will earn a degree or certificate. Exp(B) values less than one indicate the degree the variable considered (all other factors held constant) decreases the likelihood the student will earn a degree or certificate.

Results reported in Table 16 support the importance of attending consecutive semesters to earn a degree or certificate. For example, for students attending two or more consecutive semesters, Exp(B) was 3.318, so attending two or more consecutive semesters (CONSEC2)

greatly increases the likelihood that a student will complete a degree or certificate. On the other hand, each course dropped during the first semester (FSTSEMNW) slightly decreases the likelihood of earning a degree or certificate since Exp(B) is 0.985. Since confidence intervals for students needing but not taking developmental mathematics (CMDEV1), students successfully completing developmental mathematics (CMDEV3), and students not needing developmental mathematics (CMDEV4) were overlapping, their positive contribution to completing a degree or certificate are not significantly different. Some certificates require "competency in mathematics" which currently is a lower placement score than the score required for college level mathematics courses. This may have been the reason CMDEV1 had such a high value for Exp(B).

Student intent to earn a degree or certificate (GOAL2) increased the likelihood of earning a degree or certificate (Exp(B) = 1.823) also. Slightly increasing the likelihood of earning a degree or certificate were the ratio of college credits earned to college credits taken (PERCRDT), number of semesters enrolled (NSEMATT), and a students age when first enrolled.

When the model developed was applied within age groups, it was very clear that interaction effects were present. Consequently, another set of analyses was done that included interaction terms. The results of these analyses are presented in Table 17.

Insert Table 17 about here.

Older students were more likely to not have a goal of earning a degree or certificate and as a result, the GOAL2 by AGE interaction was significant, older students had a slightly reduced likelihood of completing a degree or certificate. Similarly, older students tended to take fewer

college credits (COMCRDT) and attend fewer semesters (NSEMATT) so these interactions slightly reduced the likelihood of older students earning degrees or certificates.

Summary and Conclusions

The study originally was undertaken to examine performance of students enrolled in developmental courses. Students may take developmental courses in mathematics, English, and reading to prepare for college level work. Of particular interest was how performance of students successfully completing developmental course work compared with performance of students that did not need developmental course work. Therefore the study was expanded to include students not taking developmental courses.

Students enrolling at the College for the first time during the Fall 1997 semester were tracked for four years. Information collected included: ethnicity, gender, age, student intent, placement test results, ACT examination scores, all courses (and grades) taken by the students, and whether or not a degree or certificate was earned. From the information collected, additional variables were derived including: the number of course withdrawals during the first semester, the total number of college course withdrawals, the ratio of college credits earned to college credits attempted, the number of semesters attended, the number of consecutive semesters attended, and the level of success in developmental courses.

About one third of the new students took developmental courses. Twenty-seven percent took developmental mathematics, 16% took developmental English, and almost 13% took reading. Most students that took developmental courses took them in only one subject area but 7% took courses in the three subject areas. A large percentage of students did not take placement tests and excluding students with degrees or certificates earned elsewhere or sufficient ACT scores still resulted in a large number of students without placement data. When placement

scores suggested students should take developmental courses, less than 40% of the older adults (age 25 years or older) and less than 60% of the younger adults (age 19 to 24 years) took developmental courses. Over 80% of the students 18 years or younger needing developmental courses took them.

Students from every ethnic group enrolled in developmental courses. Asian students had the lowest percent enrolling in developmental courses and African American students had the highest percent of students enrolling in them. A disproportionate number of African American students took developmental courses in all three subject areas. About the same proportion of males and females enrolled in developmental mathematics and reading courses but significantly more males enrolled in developmental English courses.

In terms of courses taken, students successfully completing developmental courses tended to earn a higher percentage of A, B, or C grades in college courses taken concurrently or after developmental English or reading courses. Regardless of when the college courses were taken, students successful in their developmental courses earned significantly more A, B, or C grades than students not successfully completing their developmental courses. Students successfully completing developmental courses had a higher average number of A, B, or C grades in college-level courses than in any other group for mathematics and English developmental subject areas. Students successfully completing developmental reading also had a higher average number of A, B, or C grades in college-level courses than any other group except for the students not needing developmental reading, which had a slightly higher average.

In terms of cumulative grade point average (GPA), the mean GPA for students successfully completing developmental courses was significantly higher than means for students with an unknown need for developmental courses, for students needing but not taking

developmental courses, and for students not successfully completing developmental courses. However, students that needed developmental courses but did not take them had significantly higher GPA means than students that did not successfully complete the courses; mean GPAs for both groups were below 2.0. There were age group and need for developmental courses interactions that particularly point to the need for additional placement testing for students in the 19 to 24 years age group. Considering GPA results, it appears that students needing and not taking developmental courses and some students in the "unknown need" groups would benefit from taking developmental courses.

In terms of student retention, students successfully completing developmental courses had the highest fall-to-spring and fall-to-fall retention rates regardless of developmental subject area studied and the rates were higher than the rates for students not needing developmental course work. Students with an unknown need for developmental courses had the lowest fall-to-spring and fall-to-fall retention rates, less than half the rates for students successfully completing developmental courses. Students in the younger age groups had higher retention rates than students in the older age group also.

Students in the two younger age groups intended to pursue a degree or certificate but less than half of the older adults intended to pursue a degree or certificate. Percents of students earning degrees or certificates reflected the differences among the age groups. Students in the 18 years or younger had the highest percent earning a degree or certificate. Taking developmental courses did not alter completion rates with one exception; students that took developmental courses in only one subject area had a significantly higher completion rate than students not taking any developmental courses. Consecutive attendance two or more semesters was the most important factor for increasing the likelihood a student would earn a degree or certificate.

In general, students successful in developmental courses are successful in their college level courses. Furthermore, taking developmental courses does not reduce the likelihood of earning a degree or certificate.

Based on the findings of this study colleges that do not have a policy of mandatory placement testing should re-examine their policy. There is also the issue of taking college level courses prior to taking needed developmental courses to consider. Since students successfully completing developmental courses are generally successful in college courses taken after completing developmental courses, colleges should consider limiting the number of college courses allowed before completing needed developmental courses.

A relatively large number of students in the 19 to 24 years and 25 years or older age groups needed but did not take developmental courses regardless of subject area. This suggests colleges serving older students should examine their developmental course offerings to determine if different course offerings might improve enrollment of older students that need the extra help in these areas.

For colleges that draw large numbers of students from local high schools, students just out of high school would benefit from the local colleges better articulating with local high schools. Sharing results of placement testing with local high schools may be a way to open a dialogue with the local high schools.

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Table 1

Students Needing (or not) Courses in each Developmental Subject Area

	Placement Test Not Taken		Placement Test Taken			
			Developmental		Developmental	
Developmental Area			Courses Not Needed		Courses Needed	
Courses taken/not taken	N	%	N	%	N	%
Mathematics						
Taken	67	1.7%	23	0.6%	948	24.5%
Not taken	1987	51.3%	371	9.6%	477	12.3%
English						
Taken	20	0.5%	13	0.3%	590	15.2%
Not taken	2364	61.0%	651	16.8%	235	6.1%
Reading						
Taken	11	0.3%	20	0.5%	460	11.9%
Not taken	2374	61.3%	826	21.3%	182	4.7%

Table 2
Percent of Students in each Age Group Not Taking COMPASS Placement Tests in Mathematics, English, or Reading

Age Group	Mathematics	English	Reading
18 years or younger (N = 1497)	24.1%	34.0%	34.2%
19 to 24 years (N = 986)	49.2%	61.5%	61.4%
25 years or older (N = 1387)	86.9%	91.1%	91.1%
All students (N = 3865)[a]	53.0%	61.5%	61.5%

[a] Age data was not available for eight new students.

Table 3

Number and Percent of Male and Female Students Enrolling in Developmental Mathematics, English, or Reading

	Mathematics		English		Reading	
Gender (N)	n	%	n	%	n	%
Male (1,673)	471	28.2%	320	19.1%	230	13.7%
Female (2,129)	563	26.4%	301	14.1%	260	12.2%
All Students (3,802)[a]	1034	27.2%	621	16.3%	490	12.9%

[a] Gender data for 71 new students was not available.

Table 4

College-Level Courses Passed with a Grade of C or Better (ABC) When Taken Before, During, or After Developmental Courses Were Taken

	College-level Courses								
	Taken Before			Taken During			Taken After		
Developmental Subject Area	Total	ABC	%	Total	ABC	%	Total	ABC	%
Course Need	N	n	%	N	n	%	N	n	%
Mathematics									
Needed, not successful	1922	1171	60.9	1203	488	40.6	1813	944	52.1
Needed, successful	1786	1496	83.8	1028	843	82.0	4512	3310	73.4
English									
Needed, not successful	372	134	36.0	382	89	23.3	529	226	42.7
Needed, successful	559	334	59.7	839	578	68.9	4114	2741	66.6
Reading									
Needed, not successful	247	63	25.5	308	68	22.1	549	310	56.5
Needed, successful	367	224	61.0	573	402	70.2	3023	1959	64.8

Table 5

College-Level Courses Passed with a Grade of C or Better (ABC) within Level of Developmental Course Need and Average Number of Courses Taken for each Developmental Subject Area

	Developmental Subject Area																	
	Mathematics						English						Reading					
Developmental Area	Total			ABC			Total			ABC			Total			ABC		
Course Need	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Need unknown	4319	3.90	4.44	1173	2.84	3.93	5677	4.54	5.01	4152	3.31	4.43	5609	4.52	5.01	4074	3.28	4.38
Needed, not taken	3234	7.87	6.28	1258	4.80	5.60	1606	8.73	7.40	1069	5.81	6.56	1239	9.25	7.81	888	6.63	6.85
Needed, not successful	4938	8.55	6.17	2335	4.51	5.07	1283	6.24	5.24	449	2.19	3.50	1104	6.34	5.84	441	2.53	4.49
Needed, successful	7326	16.55	6.23	1677	12.76	6.27	5512	13.51	6.53	3653	8.95	6.40	3963	13.03	6.68	2585	8.50	6.32
Not needed	8937	14.29	7.16	2210	10.75	7.35	14642	13.16	7.51	10758	9.67	7.41	16804	12.86	7.42	12084	9.25	7.34

Table 6

Analyses of Variance for Number of Different College Courses Attempted within Levels of Developmental Course Need and Age Group

Source	df	MS	F	η^2
	Mathematics			
Corrected model	14	5594.037	171.504*	.433
Intercept	1	102120.447	3130.840*	.499
Level of developmental course need (CMDEV)	4	4599.491	141.013*	.152
Age group (A)	2	2061.296	63.196*	.039
A × CMDEV	8	205.083	6.288*	.016
Error	3145	32.618		
Corrected total	3159			
	English			
Corrected model	14	4574.219	122.991*	.354
Intercept	1	39463.549	1061.091*	.253
Level of developmental course need (CEDEV)	4	3119.156	83.868*	.097
Age group (A)	2	1090.766	29.328*	.018
A × CEDEV	8	233.984	6.291*	.016
Error	3139	37.191		
Corrected total	3153			

*$p < .01$

(table continues)

Source	df	MS	F	η^2
	Reading			
Corrected model	14	4333.899	113.268*	.336
Intercept	1	27062.784	707.294*	.184
Level of developmental course need (CRDEV)	4	3150.074	82.328*	.095
Age group (A)	2	1242.922	32.484*	.020
A × CRDEV	8	186.409	4.872*	.012
Error	3139	38.262		
Corrected total	3153			

*$p < .01$

Table 7

Analyses of Variance for Number of Different College Courses with A, B, or C Grade on First Attempt within Levels of Developmental Course Need and Age Group

Source	df	MS	F	η^2
	Mathematics			
Corrected model	14	3554.469	120.552*	.349
Intercept	1	51679.841	1752.748*	.358
Level of developmental course need (CMDEV)	4	3144.871	106.660*	.119
Age group (A)	2	751.015	25.471*	.016
A × CMDEV	8	176.047	5.971*	.015
Error	3145	29.485		
Corrected total	3159			
	English			
Corrected model	14	2533.279	74.381*	.249
Intercept	1	16877.943	495.561*	.136
Level of developmental course need (CEDEV)	4	1797.018	52.763*	.063
Age group (A)	2	546.653	16.051*	.010
A × CEDEV	8	175.276	5.146*	.013
Error	3139	34.058		
Corrected total	3153			

*$p < .01$

(table continues)

Source	df	MS	F	η^2
	Reading			
Corrected model	14	2287.809	65.072*	.225
Intercept	1	11630.609	330.810*	.095
Level of developmental course need (CRDEV)	4	1785.956	50.798*	.061
Age group (A)	2	618.765	17.600*	.011
A × CRDEV	8	139.183	3.959*	.010
Error	3139	35.158		
Corrected total	3153			

*$p < .01$

Table 8

Average Cumulative Grade Point Average (GPA) for Students Within Level of Need for Developmental Courses for each Student Age Group and Combined Age Groups

	Student Age Group											
	18 years or younger			19 to 24 years			25 years or older			All ages		
Developmental Need	N	GPA	SD	N	GPA	SD	N	GPA	SD	N	GPA	SD
Mathematics												
Need unknown	166	2.068	1.382	366	1.660	1.415	793	2.152	1.623	1325	2.006	1.553
Needed, not taken	156	1.560	1.179	186	1.761	1.327	76	2.508	1.406	421	1.820	1.328
Needed, not successful	359	1.584	0.955	148	1.319	1.128	38	1.837	1.242	545	1.529	1.034
Needed, successful	314	2.516	0.615	64	2.519	0.793	24	3.241	0.824	402	2.560	0.680
Not needed	493	2.482	0.992	146	2.390	1.165	21	3.288	0.897	660	2.488	1.039
English												
Need unknown	173	2.140	1.371	436	1.736	1.382	821	2.163	1.612	1436	2.031	1.530
Needed, not taken	87	1.727	1.175	93	1.527	1.366	23	1.689	1.656	203	1.631	1.321
Needed, not successful	134	1.048	1.035	61	0.558	0.749	4	1.035	1.196	200	0.893	0.981
Needed, successful	306	2.201	0.601	74	2.204	0.708	10	2.040	0.623	390	2.198	0.622
Not needed	791	2.325	1.027	246	2.211	1.245	90	2.925	1.134	1128	2.349	1.100
Reading												
Need unknown	170	2.131	1.365	422	1.719	1.390	820	2.161	1.612	1418	2.027	1.534
Needed, not taken	60	1.919	1.140	73	1.639	1.323	14	2.232	1.653	147	1.810	1.292
Needed, not successful	104	0.948	0.986	56	0.628	0.811	5	0.700	0.975	165	0.832	0.937
Needed, successful	245	2.124	0.714	46	2.232	0.850	4	1.875	0.184	295	2.137	0.733
Not needed	912	2.278	1.019	312	2.097	1.245	105	2.743	1.247	1331	2.271	1.107

Table 9

Analyses of Variance for Cumulative Grade Point Average within Levels of Developmental Course Need and Age Group

Source	df	MS	F	η^2
	Mathematics			
Corrected model	14	39.227	24.864*	.094
Intercept	1	5762.695	3652.760*	.523
Level of developmental course need (CMDEV)	4	53.220	33.734*	.039
Age group (A)	2	34.430	21.824*	.013
A × CMDEV	8	5.025	3.185*	.008
Error	3145	1.578		
Corrected total	3159			
	English			
Corrected model	14	36.436	22.946*	.088
Intercept	1	1571.795	989.832*	.229
Level of developmental course need (CEDEV)	4	41.469	26.115*	.030
Age group (A)	2	10.432	6.569*	.004
A × CEDEV	8	3.407	2.145**	.005
Error	3334	1.588		
Corrected total	3348			

*$p < .01$

**$p < .05$

(table continues)

Source	df	MS	F	η^2
	Reading			
Corrected model	14	30.057	18.610*	.073
Intercept	1	1197.019	741.141*	.182
Level of developmental course need (CRDEV)	4	32.697	20.245*	.024
Age group (A)	2	6.596	4.084**	.002
A × CRDEV	8	2.251	1.394	.003
Error	3333	1.615		
Corrected total	3347			

*$p < .01$

**$p < .05$

Table 10

Fall-to-Spring Retention Rates for Level of Need in each Developmental Subject Area

	Mathematics				English				Reading			
	No Return		Returned		No Return		Returned		No Return		Returned	
Developmental Courses	N	%	N	%	N	%	N	%	N	%	N	%
Need unknown	764	57.7	561	42.3	792	55.4	638	44.6	786	55.7	626	44.3
Needed, not taken	180	42.8	241	57.2	77	37.9	126	62.1	47	32.0	100	68.0
Needed, not successful	142	26.2	401	73.8	80	40.4	118	59.6	78	47.3	87	52.7
Needed, successful	15	3.8	384	96.2	26	6.7	364	93.3	21	7.1	274	92.9
Not needed	109	16.6	546	83.4	235	20.9	887	79.1	278	21.0	1046	79.0

Table 11

Fall-to-Fall Retention Rates for Level of Need in each Developmental Subject Area

	Mathematics				English				Reading			
	No Return		Returned		No Return		Returned		No Return		Returned	
Developmental Courses	N	%	N	%	N	%	N	%	N	%	N	%
Need unknown	1002	75.6	323	24.4	1064	74.4	366	25.6	1054	74.6	358	25.4
Needed, not taken	274	65.1	147	34.9	105	51.7	98	48.3	68	46.3	79	53.7
Needed, not successful	279	51.4	264	48.6	130	65.7	68	34.3	107	64.8	58	35.2
Needed, successful	52	13.0	347	87.0	82	21.0	308	79.0	73	24.7	222	75.3
Not needed	226	34.4	429	65.5	452	40.3	670	59.7	531	40.1	793	59.9

Table 12

Fall-to-Spring and Fall-to-Fall Retention Rates for each Age Group

	Fall-to-Spring[a]				Fall-to-Fall[b]			
	No Return		Returned		No Return		Returned	
Age Group	N	%	N	%	N	%	N	%
18 years or younger	294	19.7%	1197	80.3%	565	37.9%	926	62.1%
19 to 24 years	391	43.1%	517	56.9%	582	64.1%	326	35.9%
25 years or older	535	55.6%	419	44.4%	686	72.7%	258	27.3%
All students	1210	36.2%	2133	63.8%	1833	54.8%	1510	45.2%

[a]Significant linear association, $\chi_1^2 = 339.6$, $p < .01$

[b]Significant linear association, $\chi_1^2 = 304.9$, $p < .01$

Table 13

Number and Percent of Students Earning Degrees or Certificates (EDC) Within Level of Need for Developmental Courses and Student Age Group[a]

	Student Age Group											
	18 years or younger			19 to 24 years			25 years or older			All ages		
Developmental Need	N	EDC	%	N	EDC	%	N	EDC	%	N	EDC	%
Mathematics												
Need unknown	335	63	18.8	392	19	4.8	779	51	6.5	1506	133	8.8
Needed, not taken	166	10	6.0	198	26	13.1	78	17	21.8	442	53	12.0
Needed, not successful	373	13	3.5	168	6	3.6	46	4	8.7	587	23	3.9
Needed, successful	338	129	38.2	72	20	27.8	32	11	34.4	442	160	36.2
Not needed	279	82	29.4	78	15	19.2	9	2	22.2	366	99	27.0
English												
Need unknown	499	111	22.2	523	43	8.2	823	71	8.6	1845	225	12.2
Needed, not taken	108	15	13.9	100	9	9.0	23	1	4.3	231	25	10.8
Needed, not successful	142	3	2.1	66	1	1.5	5	0	0.0	213	4	1.9
Needed, successful	314	62	19.7	79	13	16.5	15	1	6.7	408	76	18.6
Not needed	428	106	24.8	140	20	14.4	78	12	15.4	646	138	21.4
Reading												
Need unknown	504	111	22.0	527	44	8.3	824	72	8.7	1855	227	12.2
Needed, not taken	83	11	13.3	80	12	15.0	14	1	7.1	177	24	13.6
Needed, not successful	118	6	5.1	62	1	1.6	6	0	0.0	186	7	3.8
Needed, successful	252	48	19.0	46	7	15.2	7	0	0.0	305	55	18.0
Not needed	534	121	22.7	193	22	11.4	93	12	12.9	820	155	18.9

[a]Eight students were excluded from this analysis due to missing age data.

Table 14

Graduation Rates by Number of Developmental Subject Areas Studied

Number of Developmental Subjects Studied	N	Graduation Rate	
		Graduates	Percent
None	2267	289	12.7%
One	583	110	18.9%
Two	309	45	14.6%
Three	192	25	13.0%

Table 15

Percent of Students Earning an Associate's Degree or Certificate within Age Groups and Initial Intent Indicator

Age group / Intent	Number Total N	Graduating	Percent
18 years or younger	1,492	234	19.9%
Not intending to earn degree or certificate	490	63	12.9%
Intending to earn degree or certificate	1,002	234*	23.4%
19 to 24 years	895	91	9.2%
Not intending to earn degree or certificate	423	14	3.2%
Intending to earn degree or certificate	472	77*	14.0%
25 years or older	1,276	111	8.0%
Not intending to earn degree or certificate	807	33	3.9%
Intending to earn degree or certificate	469	78*	14.3%

*Percent earning a degree significantly higher ($p < .01$) compared to percent for students not intending to earn a degree or certificate within each age group.

Table 16

Logistic Regression Analysis Results of Selected Variables on Whether or Not Students Earn a Degree or Certificate (N = 3,321)

						95.0% C.I.for EXP(B)	
Variables	B	SE	Wald	df	Exp(B)	Lower	Upper
Developmental Math (CMDEV) [a]			35.489	4*			
CMDEV1	1.157	.283	16.778	1*	3.182	1.829	5.536
CMDEV2	-.260	.346	.565	1	.771	.391	1.519
CMDEV3	1.049	.261	16.217	1*	2.855	1.714	4.758
CMDEV4	.807	.269	9.030	1*	2.241	1.324	3.793
GOAL2 [b]	.601	.157	14.560	1*	1.823	1.339	2.482
PERCRDT [c]	.076	.008	85.765	1*	1.079	1.062	1.096
COMCRDT [d]	.052	.006	69.542	1*	1.053	1.041	1.066
NSEMATT [e]	.150	.051	8.765	1*	1.162	1.052	1.283
CONSEC2 [f]	1.199	.346	11.995	1*	3.318	1.683	6.541
AGE	.049	.011	21.284	1*	1.050	1.029	1.072
FSTSEMNW [g]	-.015	.006	7.711	1*	.985	.974	.995
Constant	-14.037	1.049	178.930	1*	.000		

*$p < .01$; Omnibus tests of model coefficients: Chi-square=1312.846, 11 df, $p<.001$

Model summary: -2 log likelihood=1381.965, Cox&Snell R Square=.327, Nagelkerke R Square=.588

Hosmer and Lemeshow test: Chi-square=4.803, 8 df, $p \geq .778$

[a] 1=student needing but not taking developmental courses, 2=student taking developmental courses, but not successful, 3=student successful in developmental courses, 4=student not needing developmental courses. [b] 0=student not intending to earn degree or certificate, 1=student intending to earn degree or certificate. [c] Ratio of college credits earned to college credits taken. [d] Total college credits taken. [e] Number of semesters attended. [f] 1=attended one semester, 2=attended two or more consecutive semesters. [g] Number of course withdrawals first semester.

Table 17

Logistic Regression Analysis Results of Selected Variables Including Interaction Terms on Whether or Not Students Earn a Degree or Certificate (N = 3,321)

						95.0% C.I. for EXP(B)	
Variables	B	SE	Wald	df	Exp(B)	Lower	Upper
Developmental Math (CMDEV) [a]			35.054	4*			
CMDEV(1)	1.216	.283	18.503	1*	3.375	1.939	5.875
CMDEV(2)	-.195	.347	.315	1	.823	.417	1.625
CMDEV(3)	1.020	.263	15.082	1*	2.772	1.657	4.638
CMDEV(4)	.724	.271	7.120	1*	2.064	1.212	3.513
GOAL2 [b]	.133	.402	.109	1	1.142	.519	2.513
PERCRDT [c]	.094	.016	35.493	1*	1.099	1.065	1.133
COMCRDT [d]	.101	.016	38.036	1*	1.106	1.071	1.142
NSEMATT [e]	-.137	.130	1.124	1	.872	.676	1.124
CONSEC2 [f]	1.077	.355	9.231	1*	2.937	1.466	5.885
AGE	.142	.052	7.436	1*	1.153	1.041	1.277
FSTSEMNW [g]	-.014	.006	6.189	1**	.986	.975	.997
GOAL2 by AGE	-.034	.016	4.350	1**	.967	.936	.998
PERCRDT by AGE	-.001	.001	3.135	1	.999	.998	1.000
COMCRDT by AGE	-.002	.001	10.843	1*	.998	.996	.999
NSEMATT by AGE	.013	.005	7.605	1*	1.013	1.004	1.023
Constant	-15.224	1.762	74.624	1*	.000		

*$p < .01$; **$p < .05$; Omnibus tests of model coefficients: Chi-square=1330.015, 11 df, $p<.001$

Model summary: -2 log likelihood=1364.793, Cox&Snell R Square=.331, Nagelkerke R Square=.594

Hosmer and Lemeshow test: Chi-square=4.423, 8 df, $p \geq .817$

[a] 1=student needing but not taking developmental courses, 2=student taking developmental courses, but not successful, 3=student successful in developmental courses, 4=student not needing developmental

courses. [b]0=student not intending to earn degree or certificate, 1=student intending to earn degree or certificate. [c] Ratio of college credits earned to college credits taken. [d] Total college credits taken. [e] Number of semesters attended. [f] 1=attended one semester, 2=attended two or more consecutive semesters. [g] Number of course withdrawals first semester.

List of Figures

Figure 1. Percent of new Fall 1997 students that took developmental courses between the Fall 1997 and Spring 2001 semesters.

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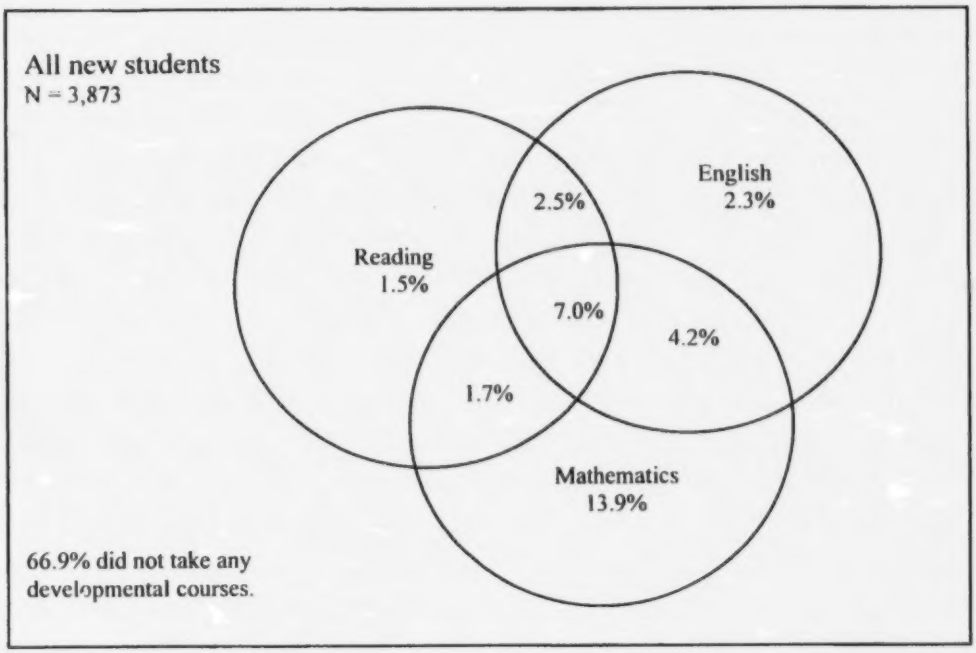
Figure 3. Percent of students taking developmental courses among students needing developmental courses for three age groups.

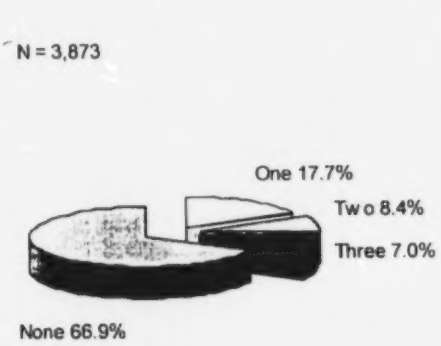
Figure 4. Number and percent of students within each ethnic group enrolled in developmental mathematics, English, or reading.

Figure 5. Student intent and percent of students enrolling in developmental mathematics, English, or reading courses.

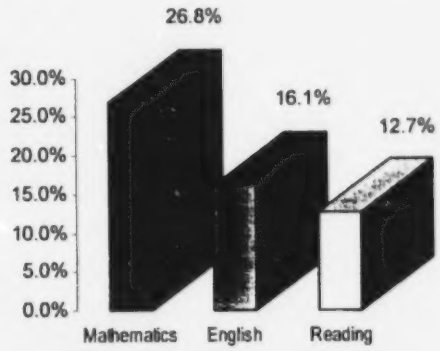
Figure 6. Graphic representation of GPA averages of students within level of need for developmental courses within student age group.

Figure 7. Fall-to-spring and fall-to-fall retention rates within levels of need for developmental subject areas and for age group.


All new students
N = 3,873
English
2.3%
2.5%
Reading
1.5%
7.0%
4.2%
1.7%
Mathematics
13.9%
66.9% did not take any
developmental courses.



Number of Developmental Subjects
In which New Students Enrolled



Percent of New Students by
Developmental Subject Area

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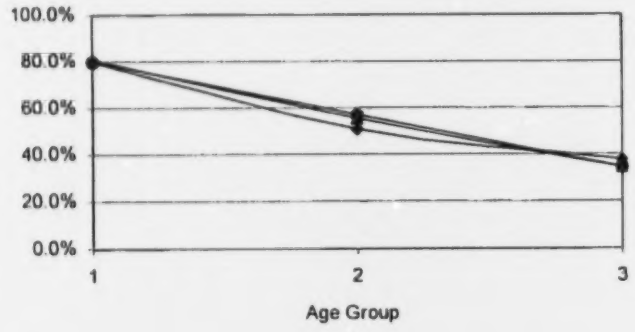
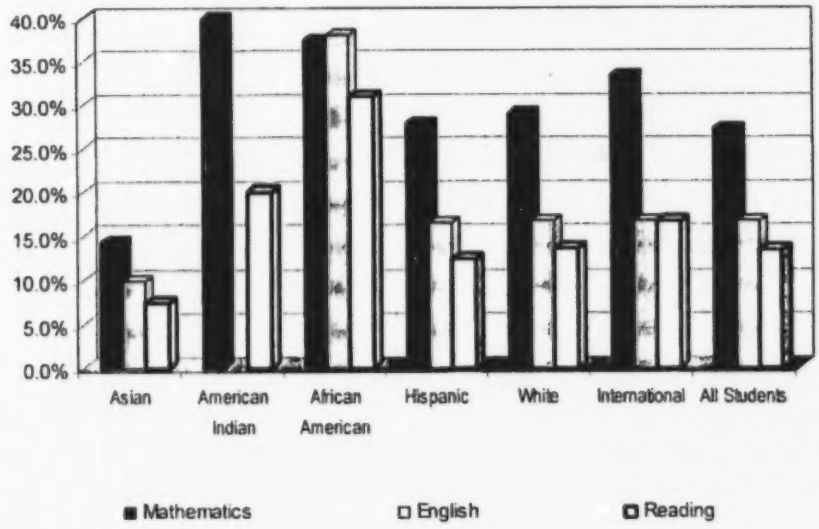


	Age Group		
Subject Area	18 years or younger (1)	19 to 24 years (2)	25 years or older (3)
Mathematics (N=1422)	80.2%	50.7%	37.6%
English (N=825)	80.3%	57.2%	35.0%
Reading (N=642)	80.8%	55.4%	34.6%



	Mathematics		English		Reading	
Ethnicity[a] (N)	n	%	n	%	n	%
Asian (466)	67	14.4%	46	9.9%	35	7.5%
American Indian (5)	2	40.0%			1	20.0%
African American (139)	52	37.4%	53	38.1%	43	30.9%
Hispanic (244)	68	27.9%	40	16.4%	30	12.3%
White (2653)	769	29.0%	443	16.7%	357	13.5%
International (18)	6	33.3%	3	16.7%	3	16.7%
All Students (3525)	964	27.3%	585	16.6%	469	13.3%

[a] Ethnicity data for 348 new students was not available.

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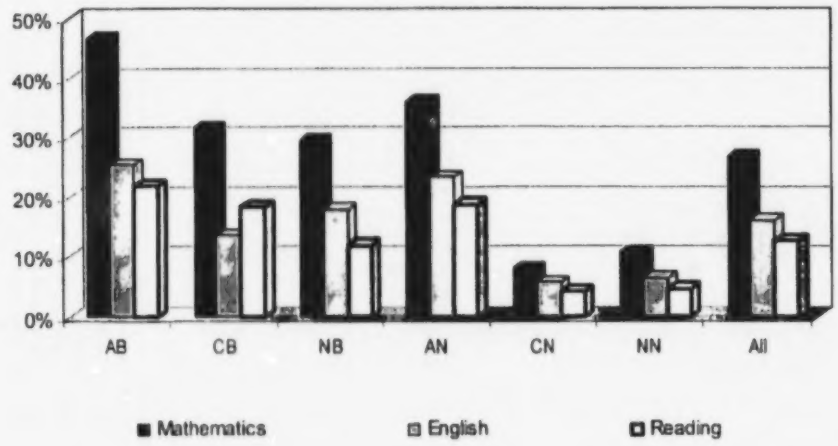

	Mathematics		English		Reading	
Student Intent	n	%	n	%	n	%
Associate and Bachelors (AB, N=776)	363	46.8%	198	25.5%	169	21.8%
Certificate and Bachelors (CB, N=22)	7	31.8%	3	13.6%	4	18.2%
Bachelors only (NB, N=539)	159	29.5%	96	17.8%	64	11.9%
Associate only (AN, N=961)	346	36.0%	225	23.4%	180	18.7%
Certificate only (CN, N=330)	27	8.2%	19	5.8%	14	4.2%
Neither Associate nor Certificate (NN, N=1,232)	133	10.8%	80	6.5%	58	4.7%
All students (All, N=3,860)[a]	1035	26.8%	621	16.1%	489	12.7%

[a] Student intent data was not available for 13 new students.

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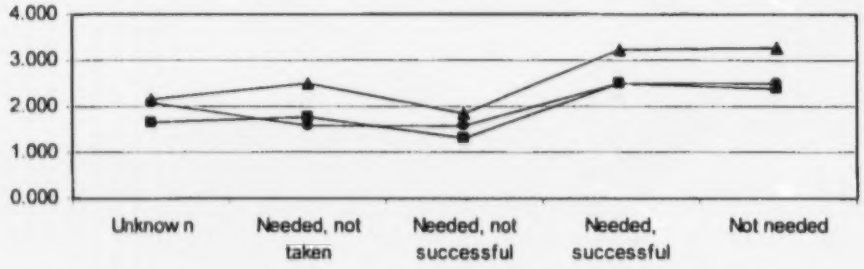
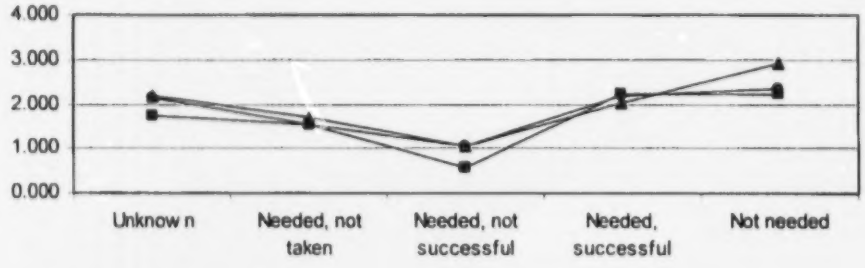
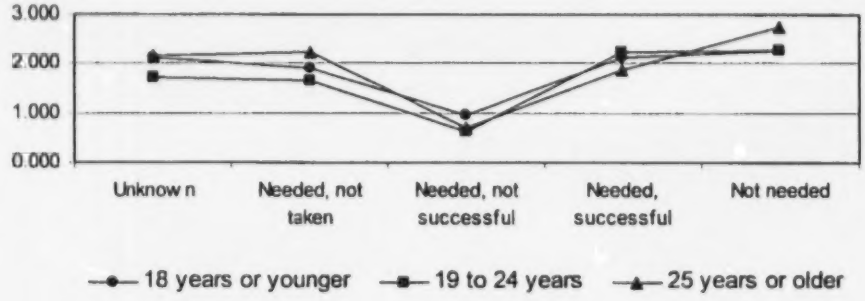
Mathematics

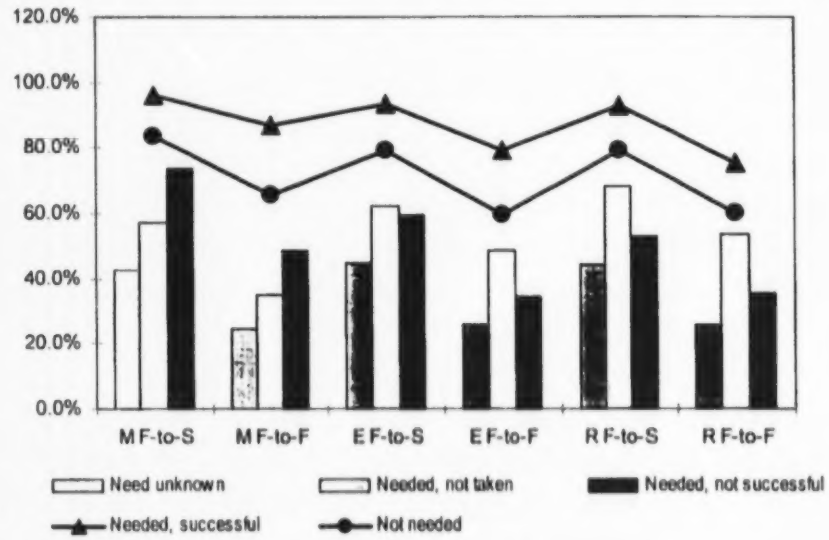


English

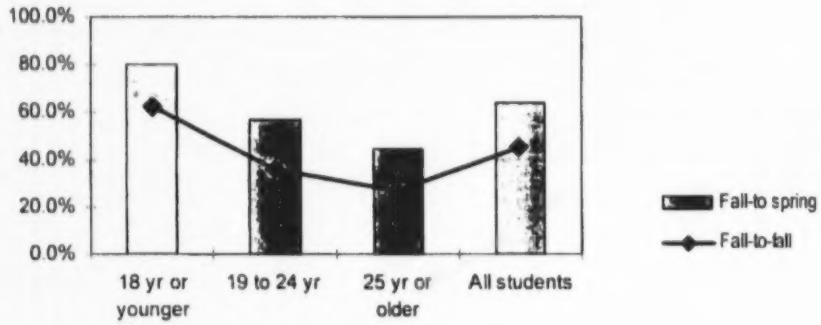


Reading





M = Developmental Mathematics; E = Developmental English; R = Developmental Reading
F-to-S = Fall-to-Spring; F-to-F = Fall-to-Fall
"Needed, successful" and "Not needed" groups are line graphs above the bar graphs.



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